Journal of the Society of Arts.

FRIDAY, DECEMBER 25, 1857.

COUNCIL MEETING.

WEDNESDAY, DECEMBER 23, 1857.

The following Institutions have been taken into Union since the last announcement:—

448. Sheffield, Mechanics' Institution.
449. Bideford, Mechanics' and Literary Institute.

NOTICE TO INSTITUTIONS. CONFERENCE.

The Council have fixed to hold a Conference of Representatives from Institutions in London and the neighbourhood, with a view to the organisation of Local Boards in connection with the Examinations. The Conference will take place on Monday evening, the 11th of January, at six o'clock, when the attendance of two or three Representatives from each Institution is invited. Representatives from Institutions not in Union with the Society are also invited to be present.

EXAMINATIONS.

The Council have assented to the proposal, made by the Institutional Association of Lancashire and Cheshire, that they may be allowed to hold the Preliminary Examination for 1858 in Lancashire and Cheshire, in Easter week, six weeks before Whitsuntide, instead of twelve weeks before, as laid down in the Programme; the report to be furnished to the Council not less than five weeks before Whitsuntide.

THE LIQUID MANURE QUESTION.

The attention of the Council having been called to an extract from *Bell's Weekly Messenger* inserted in the *Journal* of the 25th of September, they desire to express their regret that it should have been inadvertently inserted, as containing observations reflecting personally upon individuals.

VANILLA.

Some little time since the Society received, through Mr. Blechynden, the Secretary of the Agricultural and Horticultural Society of India, some pods of the *Vanilla aromatica* and *V. planifolia*, grown in the garden belonging to that Society. Mr. Blechynden writes, in reference to these pods, as follows:—

"These plants have been some years introduced into India, but it is only recently that we have been able to obtain fruit from them by resorting to artificial means. The plant is propagated most readily, and will no doubt be soon naturalised here." The pods have been placed in the hands of Messrs. Cartell and Brown, of Princes-street, Leicester-square, for trial, who report as follows:

"We have used the vanilla sent, and find the strength good. The pods were very small, and were much dried in consequence of being packed in wadding, instead of being wrapped in tinfoil and packed in a tin case. We consider it of good quality. To make it of commercial value the pods should be long and of a very dark colour, almost approaching to black. They should also be moist, and if properly ripened before being packed, they become, after a time, covered with minute acicular crystals, which much add to their appearance and marketable value. The value of the pods sent was about 50s. per lb. Had it been fine (say 1½ inches longer), and in the condition above mentioned, it would realise from 80s. to 90s. per lb. The present price of vanilla is about 20s. per lb. above the average value."

ON THE COMPARATIVE CAPABILITIES OF STEAM-SHIPS AS DEPENDING ON THEIR MAGNITUDE.

BY CHARLES ATHERTON, CHIEF ENGINEER, ROYAL DOCKYARD, WOOLWICH.

Experience of the past four years, especially in connection with the steam transport service of the Crimean war, events now in progress as respects our steam communication with China and India for military purposes, the present aspect of the probable future, opening up as it does a totally new era and order of things as respects mercantile intercommunication between England and the far distant regions of India, Australia, China, California, and Japan, involving the circumnavigation of the globe by the agency of steam, are circumstances which at the present time give peculiar significance to an inquiry which of late I have been instrumental in agitating, viz., an inquiry into the capabilities of steam-ships of extraordinary magnitude as compared with the capabilities of vessels of ordinary size. Under the influence of these convictions, as to the material importance of this subject, vitally connected as it is with the future advancement of arts, manufactures, and commerce, I beg to be permitted to avail myself of the facilities afforded by the *Journal of the Society of Arts* to promulgate certain inquiries and investigations on the subject referred to, and which, though previously brought forward elsewhere,* have never been subjected to the ordeal of public discussion, such as the importance of the inquiry undoubtedly demands.

Having thus briefly explained the purpose of my communication, I proceed, with your permission, to bring before the notice of your numerous readers the views which I entertain in demonstration.

1st. As to the superior capabilities of large ships, as compared with smaller vessels, in a purely mechanical point of view, for the performance of any specified length of voyage, without re-coaling, at any given rate of speed.

2nd. As to the mercantile limitations at which the admitted mechanical advantage which results from increased size of ship becomes neutralised, if, on the strength of increased size alone, we undertake mercantile obligations involving the stipulated performance of an increased rate of speed, combined with an increased distance without re-coaling, such, for example, as making a long passage direct without touching at intermediate coaling stations, which may be accessible to, and made available by, smaller vessels.

The elemental data on which the following tabular statements have been calculated are as follow, viz.:—That the weight of the hull and equipment (exclusive of the engines and coals), when ready for sea, will appropriate 40 per cent. of the mean displacement; that the weight of the engines, boilers, &c., in complete working order, will be 5cwt. per indicated horse-power; that the consumption of coals will be at the rate of 4½lbs. per indicated horse-power per hour; that the type and con-

* Appendix to Atherton's "Steam Ship Capability" (2nd Edition).

dition of vessel, and the performance of the engines, will be such as when deduced from the formula $\frac{V^3 D^{\frac{2}{3}}}{\text{Ind. h.p.}} = C$ will give a co-efficient or index number (C) equal to the number 215·5, which is believed to be a high average estimate of the scale of duty performed by steam-ships at sea.

With these elemental data, it is purposed to show, in tabular form, the respective capabilities of a series of vessels of the following progressive sizes, as measured by their mean sea-displacement, viz., 5,000 tons mean displacement, 10,000 tons, and 20,000 tons mean displacement, the mutual relations of displacement, power, and speed being calculated by the formula above stated.

Table No. 1, showing the superior capability of large ships, as indicated by a progressively increasing rate of speed corresponding to a progressively increasing size of ship; the proportion of displacement to power being assumed, in all cases, constant, namely, two tons weight of displacement to one indicated h.p., of 33,000 lbs., raised one foot per minute:—

Displacement. Tons.	Indicated H.P.	Speed. Knots.
5000	2500	12·27
10000	5000	13·25
20000	10000	14·31

Hence, it appears that the same proportion of power to displacement which drives ships of 5,000 tons displacement 12 knots an hour will drive a ship of 10,000 tons, on the same type of build, at 13 knots, and a ship of 20,000 tons at 14 knots per hour.

Table No. 2, showing the superior capability of large ships as indicated by the progressively reduced ratio of power to displacement, whereby a constant speed is given to vessels of progressively increasing size; the calculation being made for the constant speed of 15 nautical miles an hour:—

Displacement. Tons.	Speed. Knots.	Indicated H.P.	Ratio of Displacement to Indicated H.P.
5000	15	4569	100 to 91
10000	15	7252	100 to 72
20000	15	11513	100 to 57

Hence, it appears that to attain the speed of 15 knots an hour, the ship of 5,000 tons displacement requires 91 Indicated H.P. for each 100 tons of displacement; but the ship of 10,000 tons displacement, on the same type of build, requires 72 Indicated H.P. for each 100 tons displacement, and the ship of 20,000 tons on the same type of build will require only 57 Indicated H.P. for each 100 tons of displacement.

Table No. 3, showing the superior capability of large ships as indicated by the progressively increasing distance capable of being run, without re-coaling, at a given rate of speed (say 15 knots an hour), and with a given per centage of the displacement appropriated to cargo (say 10 per cent.)

Mid-passage Displacement.	Speed.	Indicated H.P.	Cargo (10 per cent. of Displacement).	Coal.	Distance (without re-coaling).
Tons.	Knots.		Tons.	Tons.	Naut. Miles.
5000	15	4569	500	2716	4440
10000	15	7252	1000	6374	6555
20000	15	11513	2000	14244	9240

Hence, it appears that, at the speed of 15 knots an hour, and with 10 per cent. of the displacement appropriated to cargo, the ship of 5,000 tons displacement will steam a distance of only 4,440 miles without re-coaling; but the ship of 10,000 tons will, under the same conditions, steam 6,555 miles without re-coaling, and the ship of 20,000 tons, will, under the same conditions, steam 9,240 miles without re-coaling, at the speed of 15 knots per hour.

Table No. 4, showing the superior capability of large ships as indicated by the reduced consumption of fuel per ton of cargo at which goods will be conveyed a given distance, without re-coaling, at a given speed; supposing, for example, that the distance, without re-coaling, is to be 3,250 nautical miles and the speed 10 nautical miles an hour:—

Mid-passage Displacement.	Speed (per hour)	Indicated H.P.	Distance.	Coal.	Cargo.	Tons of Coal per Ton of Cargo.	Deep-draught Displacement.
Tons.	Knots.		Naut. Miles.	Tons.	Tons.		Tons.
5000	10	1354	3250	884	2219	·40	5442
10000	10	2149	3250	1403	4762	·29	10701
20000	10	3411	3250	2227	10034	·22	21113

Hence, it appears that, in the case of a 3,250 miles direct passage at 10 knots an hour, by increasing the size of the ship from 5,442 tons to 21,113 tons of deep-draught displacement, the consumption of coal per ton of cargo conveyed is reduced from $\frac{40}{100}$ down to $\frac{22}{100}$ being a reduction of nearly 50 per cent in favour of the larger ship.

The foregoing tables having thus illustrated the superior capabilities of large ships as compared with smaller vessels for the performance of any special service under the same specific conditions of speed and distance without re-coaling, the following table (No. 5) is intended to show how soon the admitted advantages which result from increased size become neutralized, if, on the strength of increased size alone, we undertake obligations which involve, on the part of a large ship, an increased rate of speed combined with an increased distance, without re-coaling; to demonstrate which, we will assume that in the prosecution of a steam-ship project on a line of communication extending a distance of 12,500 nautical miles (such, for example, as the line between England and Calcutta), it is intended to employ shipping to the aggregate extent of about 20,000 tons, to be propelled by steam-power in the proportion of 2 tons of Displacement to 1 Indicated H.P. The problem now is to determine whether, as respects speed and the consumption of coal per ton weight of cargo conveyed, the proposed service will be most advantageously performed by

Scheme No. 1, viz.,

One vessel of 20,000 tons Mean or Mid Passage Displacement and 10,000 Indicated H.P., making the passage of 12,500 nautical miles *direct*, at the speed of 14·31 nautical miles an hour; or by

Scheme No. 2, viz.,

Two vessels each of 10,000 tons Mean or Mid Passage Displacement and 5,000 Indicated H.P., making the passage in 2 stages of 6,250 nautical miles, at the speed of 13·25 nautical miles an hour; or by

Scheme No. 3, viz.,

Four vessels each of 5,000 tons Mean or Mid Passage Displacement and 2,500 Indicated H.P., making the passage in 4 stages of 3,250 nautical miles, at the speed of 12·27 nautical miles an hour.

It will be found by calculations based on the data before referred to, that the mutual relations of displacement, power, speed, length of passage, cargo, and coals, which result respectively from the above mentioned three

schemes of shipping, will be as represented by the following TABLE, No. 5:—

Scheme.	Mean or Mid-passage Displacement.	Indicated H.P.	Speed per hour.	Distance 12500 Nautical Miles.	Steaming Time.	Consumption of Coal on the entire passage.	Cargo.	Coal per Ton of Cargo.	Deep Displacement.
	Tons.		N.M.		D.H.	Tons.	Tons.	Tons.	Tons.
1	20000	10000	14·31	1 stage of 12500	36·10	17550	725	24	28775
2	10000	5000	13·25	2 stages of 6250=12500	39·8	9478	2381	4	12369
3	5000	2500	12·27	4 stages of 3250=13000	44·3	5316	1711	3	5664

From the above table we observe the following results, namely:—

The steaming speeds by the above proposed 3 Schemes respectively will be at the rate of about 14, 13, and 12 nautical miles per hour: the steaming time at sea on the passage of 12,500 miles will be about 36, 39, and 44 days by the 3 Schemes respectively, and allowing 4 days for re-coaling the 10,000 tons ship (Scheme No. 2) at the one intermediate station, and 2 days for re-coaling the 5,000 tons ship (Scheme No. 3) at each of the three intermediate stations, being altogether 6 days: then the whole time of passage between England and Calcutta by the 3 Schemes respectively would be 36 days, 43 days, and 50 days; being 14 days shorter time of passage in favour of the one ship (Scheme No. 1) as compared with the 4 ships (Scheme No. 3); but the Mercantile sacrifice which attends this saving of 14 days by Scheme No. 1, as compared with Scheme No. 3, is, that by Scheme No. 1, 17,550 tons of coal are consumed in the conveyance of only 725 tons of cargo, being at the rate of 24 tons of coal per ton of cargo, while *each* of the 4 ships of Scheme No. 3 consumes 5,316 tons of coal in the conveyance of 1,711 tons of cargo, being at the rate of 3 tons of coal per ton of cargo. Thus, notwithstanding the superior capabilities of large ships as compared with smaller vessels for performing any special service on equal conditions in regard to speed and distance without re-coaling (as shown by Tables 1, 2, 3, and 4,) we see, in the case now before us, (as shown by Table No. 5,) assuming each ship to make the same number of passages per annum (for, the larger ships, though a shorter time at sea, will be detained the longer in port,) that the four ship Scheme, No. 3, as compared with the one ship Scheme, No. 1, is, under the different conditions as to speed and coaling stations above stated, capable of transporting between England and Calcutta nearly 10 times the aggregate weight of cargo per annum with one-eighth of the consumption of coal per ton of cargo conveyed, but with an admitted sacrifice of 14 days on the time of passage.

If, however, the consumption of fuel on board of ship be reduced from 4½ lbs. per Indicated H.P. per hour, on which the foregoing calculations have been based, down to 3 lbs. per Indicated H.P. per hour, which is theoretically possible, and, therefore, it is hoped, may be achieved, then, on the same principle of calculation and under the above stated conditions as to loss of time by Scheme No. 3, it would still be found that the four ship Scheme, No. 3, as compared with the one ship Scheme, No. 1, would transport about double the weight of cargo per annum between England and Calcutta with about one-half of the consumption of fuel per ton of cargo conveyed, but, as before stated, with an admitted sacrifice of 14 days on the time of passage.

The consumption of fuel per ton of cargo conveyed is, as one item of expense, perhaps the best criterion of the relative merits of different Schemes of Steam Navigation as respects mercantile economy; and, on inspecting Table No. 5 with reference to this point, it will be observed that the 2nd and 3rd Schemes are very nearly on a par with each other, that is, under the assumed working arrangements of these schemes as above set forth, a vessel of 5,664 tons deep-draught displacement fitted for steaming at 12 knots per hour, and re-coaling at intervals of 3,250 miles, will convey cargo somewhat more economically than a vessel of 12,369 tons deep-draught displacement fitted for steaming at 13 knots per hour, and re-coaling at intervals of 6,250 nautical miles, and as compared with a vessel of 28,775 tons deep-draught displacement fitted for steaming at 14 knots per hour, and making the passage of 12,500 miles direct, without re-coaling at any intermediate station, the difference in point of freight economy, as indicated by the economy of coal per ton of cargo conveyed, is so greatly in favour of the smaller vessel, time excepted, that a vessel working under such conditions, viz., 14 knot speed combined with a 12,500 mile distance, without re-coaling, can only be regarded as a packet-ship for mails and passengers not profitably available for mercantile cargo.

If, however, the ship for Scheme No. 1 be constructed for a deep-draught displacement of 26,000 tons, and be fitted for the reduced speed of 12 knots per hour, the direct passage of 12,500 miles would then occupy 44 days, the consumption of fuel at 3 lbs. per Indicated H.P. per hour would be 12,000 tons, and the displacement available for cargo would be 4,000 tons weight, being at the rate of 3 tons of coal per ton of cargo conveyed, or about the same expenditure of coal per ton of cargo as that incurred by each of the 5,664 tons ship, (Scheme No. 3) steaming at the same speed, viz., 12 knots per hour, but re-coaling at intervals of 3,250 nautical miles, and taking, including stoppages (6 days) for re-coaling, 50 days for the passage; being an admitted superiority of 6 days in favour of the direct passage of the ship of 26,000 tons. The question is, whether this result, viz., the saving of 6 days by the large ship, will adequately compensate for the extraordinary requirements of its realisation.

In all the foregoing statements, the mutual relation of displacement, power, and speed, have been calculated without reference to the influence of wind and current, which, indeed, may be regarded as obstructing the regular performance of a high speed service; for, a favourable wind, such as might help a vessel steaming at 12 knots an hour (as in Scheme No. 3), may afford no aid or even oppose a vessel steaming at 14 knots an hour (as in Scheme No. 1); and an adverse wind will obstruct a vessel steaming at a high speed in a greater ratio than it would obstruct the low speed ship.

Sailing clippers scarcely average 7½ knots per hour; an average speed of 10 knots may be expected from the joint action of sail and auxiliary steam-power, but an average speed of 15 knots outruns even a favourable wind, and can only be depended upon from steam alone.

The foregoing remarks presume on there being no limitation to the draught of water whereby the ship of extraordinary magnitude may be prevented from having that type of form, as respects the proportions of length and breadth to depth, which is found to be most conducive to the realisation of a high scale or co-efficient of dynamic duty, and which may be adopted in the construction of the smaller vessels, its rivals. This is one obstacle tending to limit the magnitude of ships, and another obstacle of a somewhat analogous character consists in this, viz., that the cost of the construction of ships, and in some respects the working charges on shipping, are regulated by their nominal tonnage, either builder's tonnage or register tonnage, and it admits of demonstration, that neither the builder's tonnage nor the register tonnage is any definite or proportional measure of the respective weight-carrying capabilities of ships of different proportions of build, but it is found that the shallower a ship is in proportion to her beam, the smaller will be her weight-carrying capability in proportion to her builder's or register tonnage. For example: a ship of 1000 tons builder's measure, of which the load-draught of water is one-half of the beam,

may be able to carry 800 tons weight, but another ship of 1000 tons, having the load-draught of water only one-third of the beam, would probably carry only 450 tons, and yet the cost of construction of both these ships may be nearly the same, though one is capable of carrying nearly double the weight of the other.* Hence, therefore, the probability of a ship of extraordinary length and breadth, but comparatively shallow depth, being constructively an expensive ship in proportion to her capability for carrying tons weight of cargo, even though always loaded down to her deep draught line, but it is to be observed that such vessels, though unfavourable for heavy cargo, afford great accommodation for the conveyance of passengers.

Such are a few deductions from mechanical principles, which, irrespectively of commercial considerations as to the loss which may result from monster ships being laid up for repairs, or inadequately loaded on the one hand, or the market of their destination being suddenly glutted on the other, manifestly constitute most serious matter for reflection in connection with monster ships; times and circumstances may demand their use, but times and circumstances also impose limits, both mechanical and mercantile, to the advantageous construction and employment of monster ships, which, if not duly considered, are likely to result in a monster mistake.

THE PURCHASE OF THE SOULAGES COLLECTION FOR PUBLIC INSTRUCTION.

Another effort is being made to prevent the dispersion of this useful collection. The Manchester Art Treasures Committee, not having realised a sufficient surplus to secure the collection for Manchester, have been obliged, according to their agreement, to offer it to the Government, and, with the view of pointing out the great practical value of the collection to the Decorative Arts, two influential deputations have recently waited upon Lord Granville, as President of the Council of Education.

The following gentlemen attended as a deputation, representing manufacturers and others connected with art industry:—Messrs. Holland, Gillow, Trollope, Phillips, Hart and Son, P. Graham, and Crace, all of London; and Mr. Charles Ratcliff, of Birmingham, who represented the Mayor of that town, that gentleman being unable to be present. A deputation also attended from the Royal Institute of British Architects, consisting of Mr. W. Tite, M.P., Professor Donaldson, Mr. Digby Wyatt, Mr. Owen Jones, and other members of that body.

The deputation was introduced to the Lord President of the Council by Mr. Tite, M.P., (in the unavoidable absence of Earl de Grey,) who briefly explained the motives which had caused the deputation to ask for an interview with Lord Granville.

Professor Donaldson then addressed Lord Granville, dwelling upon the duty incumbent on the government of the country to secure every available material for developing technical industry in its alliance with art. In this country, every object which constituted such material rose to so great a value as to set a practical bar to the accumulation of works for purposes of instruction to any considerable extent. The Professor enumerated various instances of the rapid increase which had taken place of late years, and indeed very recently, in the cost of objects of *vertu*, and dwelt upon the opportunity which had been lost by her Majesty's government of acquiring the fine collection dispersed after the death of the late Mr. Bernal.

Mr. Owen Jones represented the importance of the practical lessons to be derived from the objects which constituted the Soulages' Collection; and he felt sure it was scarcely necessary to press upon the Lord President of the Committee of Council on Education the excellent results which must accrue to the trade and commerce of this country, whenever the workmen of the present age should be enabled to rival, in a graceful union of art with industry, the workmen by whom the valuable series of objects under consideration had been produced.

Mr. Digby Wyatt drew attention to the great encouragement given to the productions of partially educated workmen at the present time, and to the danger which might result from that encouragement, unless models of the highest excellence were kept constantly before the eyes of artisans, as an inducement and encouragement to them to attain the highest degree of excellence, and not to be contented with the cheap and rapid production of mere mediocrity. He felt assured that this question might most justly be entertained, not upon local grounds only, but upon those of the important interests of the nation at large. The extent of the commerce resulting in France from the intimate connection between art and industry was so great as to prove a source of vast revenue to the country; and it was certain that any measure by which an honourable competition might be entered upon between this country and our neighbours, in the production of objects calculated to minister to luxury, would be fraught with the happiest results. The objects which composed the Soulages' Collection had been produced at the richest period of Italian grandeur, and when society, in respect to its demand for articles of luxury, was upon a somewhat parallel footing with that which obtained at the present day. That class of objects could not, therefore, but offer most important practical lessons.

Mr. Tite, M.P., spoke of the small amount of the sum asked for the Soulages' Collection (about £14,750) as compared with the vast interests connected with the art industry of this country; and he was inclined to believe that any sum of money of a moderate amount, expended in the formation of industrial museums, could not but result in a most satisfactory increase of the revenue of the country.

Mr. Peter Graham (of the firm of Graham and Jackson, Oxford-street), on the part of the manufacturers of the metropolis, spoke in favour of the purchase by the Government of the Soulages' Collection. The manufacturers of this country were placed at great disadvantage, as compared with other countries, in respect of such collections as that about the purchase of which they had assembled. Such a collection suggested new forms—new ideas—greater variety—and materially assisted art and decorative operations. It was not London alone that wished Government to purchase the collection, but manufacturing towns in the country, such as Birmingham, were desirous that the collection should be purchased for the nation. It was desirable that the collection should be purchased with the least possible delay, for some of the objects became more and more rare every day, and, therefore, became enhanced in price.

Mr. Ratcliff (of Birmingham) said the mayor of the town which he had the honour to represent on that occasion would have been present at the interview, but for the intervention of official duties. He, however, was authorised to say that the mayor was most anxious that the Soulages' Collection should be purchased by Government, being well aware of the great advantages which it was calculated to confer upon the manufacturing interests of the country, and that it would be most valuable to Birmingham.

Earl Granville said he so entirely concurred with the general feeling which had been expressed by the deputation, that their words were almost equivalent to an attempt to convert a convert—(A laugh). The difficulties in the way, as they must be well aware, were, so far as he was concerned, entirely of a financial character. While constant efforts were being made by the ministry

* See *Journal of the Society of Arts*, No. 249, "Suggestions for Statistical Enquiry into the Extent to which Mercantile Steam Transport Economy is Affected by the Constructive Type of Shipping, as Respects the Proportions of Length, Breadth, and Depth," by Charles Atherton.

to reduce taxation, any proposal involving an unforseen expenditure was sure to be regarded with great apprehension, if not disapprobation. This question must, however, he felt, rest upon its intrinsic merits; and he thought they had only to be placed in a sufficiently strong form before the heads of her Majesty's Government to induce them to lend a willing ear to the present application. He should consult his colleagues on the subject, and probably it might be well if some gentlemen who took an interest in it waited upon the Chancellor of the Exchequer, as it was a matter involving the expenditure of money.

In accordance with the suggestion of Lord Granville, steps are being taken by many influential persons engaged in the decorative trades to obtain such an expression of their sense of the value of this collection, as to render it difficult for the Chancellor of the Exchequer to refuse their request, unless he is prepared to advise Parliament to withdraw all State aid from the British Museum, National Galleries, and other public collections.

FIRE AND POLICE TELEGRAPH.

By Sydney S. Waterlow.

The following is a plan for effecting telegraphic communication between police and fire brigade stations of the metropolis. As these matters are at present under the authority of three distinct bodies, it would be necessary to have a distinct telegraph for each body, perfect in itself, but capable of instantaneously uniting with the other two, so as to form one system in case of necessity from fire or public commotion.

It has long been a matter of surprise and regret, that while the electric telegraph extends itself over the length and breadth of the land, connecting the nearest and the remotest towns of the United Kingdom with the metropolis, its advantages have not hitherto been secured as a means of transmitting instantaneous intelligence between the numerous police and fire establishements, which have under their care the protection of life and property.

The immense destruction of property and the melancholy sacrifice of human life by fire, the poverty and distress consequent thereon, are subjects deserving the most serious consideration. The existence of such a ready and instantaneous means of procuring assistance in times of danger as the electric telegraph affords, would impart, as it were, a new feeling of security to the inhabitants of our large and densely populated towns.

The City of London, built as it is upon an undulating ground, is peculiarly favourable to the development of a system of over-house telegraphs. The plan has been successfully adopted in New York, Paris, Brussels, and many other large continental towns. In America, wires have been carried upwards of a mile without any intermediate support, and have now been in operation several years.

In advocating a plan of over-house telegraphs, I have no desire to depreciate the merits of the under-ground system, except on the score of expense, the difference in which respect is enormous, and the City would entail upon itself a perpetual source of annoyance to the public by its adoption. When the under-ground wires are injured or become impaired, it is difficult to find the exact locality where the mischief arises; but if any accident should befall the suspended wires, the injury could be immediately discovered and as speedily repaired. To replace an impaired wire would be only the work of an hour, while if it were under-ground, its repair would be a work of days, besides the annoyance of shopkeepers, and the interruption of traffic occasioned by opening the streets.

As to the *modus operandi*.—It being understood that on the appearance of the "fire" signal at either of the junctions the systems are to be immediately united, the same signal would instantaneously appear on the telegraph dials at every police and fire brigade station in the metropolis. The exact locality of the fire, its extent, the number of engines and police required, would be immediately transmitted to all or to particular stations according to circumstances. Should the fire be extinguished, notice could be sent, and the engines stopped, or they might be intercepted by the police, or by information to be obtained at any fire or police station on the way. False alarms could not, as at present, harass the brigade, or impose unnecessary trouble and expense in dragging out engines and fire escapes when not wanted.

When a fire breaks out now, the police, or any person who may happen at the time to be present, hastens to the nearest fire station, which may be a long distance from the scene of the conflagration, and then from the station messengers are again sent to all the others. Sometimes, at night, the reflection gives the alarm, and is the only guide, though too often a deceptive one, the firemen have to direct them to the spot where their services are required. All these proceedings occupy much time; and often, before the engines have arrived, the premises are entirely destroyed; in other cases, the fire has been subdued, and in others the alarm is found to be false. Nevertheless, engine after engine continues to arrive, to no purpose, when (and such has been often the case) other fires are raging in the very neighbourhood from which they have been unnecessarily withdrawn. The telegraph, as already observed, would be the means of concentrating at any required spot the whole power of the brigade; and the authorities at the chief fire station in Watling-street, or the chief police station in Old Jewry or Scotland-yard, would be enabled to regulate the movements of their men as accurately as if they were under their own eyes —a system which cannot fail to result in the saving of much trouble, expense, an immense amount of property and human life. It has been very truly observed, there can be no doubt that in many a half-hour, occupied by messengers, &c., a larger amount of property has been destroyed than would have paid for constructing a most efficient and complete telegraphic system, embracing the whole of the metropolis. Of the truth of this, the fire at Camden Town affords a ready illustration.

Although, to an observer, the working the telegraph may appear complex and difficult, it is in reality but a question of practice, as the young men upon the railways are very soon trained to transmit messages in an expeditious and accurate manner, in addition to their other duties.

Having thus endeavoured to point out the manner in which the electric telegraph may be beneficially and advantageously applied to the purposes above described, I sincerely trust that, however inadequate this attempt may be, the public will give the subject that fair consideration which its importance demands; feeling sure, that if the scheme is well considered, the day is not far distant when it must be carried out.

Carpenter's-hall, London Wall.

ALLEGED INFLUENCE OF SOLAR LIGHT ON COMBUSTION.

Some researches on this subject have lately been made by Dr. J. Le Conte, Professor of Natural Philosophy in South Carolina College, U.S., and the results were embodied in a paper* read before the American Association for the Advancement of Science. The following is an abstract of the paper:—

A popular opinion has long prevailed that the admission of the light of the sun to an ordinary fire tends to retard the process of combustion, and even ultimately to put it out. About thirty-two years ago Dr. Thomas M'Keever published a series of experiments in the "Annals of Philosopy" (new series, vol. 10, p. 344),

* American Journal of Science and Arts for November, 1857, p. 317.

which seemed to confirm this notion. Gmelin, in his "Handbook of Chemistry" (Cavendish Society's translation), vol. 2, p. 35, announces Dr. M'Keever's results without comment; and in Brewster's "Edinburgh Journal of Science" (vol. 5, p. 180, 1826), it is said, "It has always been considered a vulgar error that the sun's light extinguishes a fire, but the following experiments by Dr. M'Keever put the matter beyond a doubt."

Looking, however, at the important bearing which these experiments appear to have on the modern dynamical theory of the mutual convertibility of the so-called imponderables, Prof. Le Conte was induced to undertake a series of experiments to test Dr. M'Keever's conclusions. Dr. M'Keever's results are as follows:—

Expt. 1.—Green Wax Taper lost in 5 minutes,

In Dark. Temp. 67°. 9·25 grs.	In Sunshine, Temp. 78° 8·5 grs.	Ratio. 1 : 1·088

Expt. 2.—Taper lost, by burning 7 minutes, in

Dark, Temp. 67° 11 grs.	Sunshine, Temp. 78° 10 grs.	Ratio. 1 : 1·100

Expt. 3.—Mould Candle, to consume 1 inch took, in

Dark, Temp. 68° 56m. 0s.	Sunshine, Temp. 80° 59m. 0s.	Ratio. 1 : 1·053

Expt. 4.—Taper, to consume 1 inch took, in

Dark, Temp. 67° 4m. 30s.	Sunshine, Temp. 79° 5m. 0s.	Ratio. 1 : 1·111

Expt. 5.—Taper in Sunshine lost in 10 minutes,

In Painted Lantern. 16·5 grs.	In Uncoated Lantern. 15 grs.	Ratio. 1 : 1·100

The *sixth* experiment, made in strong *moonlight*, indicated no diminution in the rate of consumption.

Dr. M'Keever concluded that solar light did exercise a retarding influence on combustion, and attributed the effect to the well-known influence of the solar rays in many chemical processes, the chemical rays being supposed to exercise a *deoxydising* power. Prof. Le Conte considered that the experiments of M'Keever were liable to error, owing to disturbances in the atmosphere when the experiments were conducted in the open air, and the difficulty of procuring precisely the same conditions in relation to the air supplied to the interior of the lantern. He therefore endeavoured to secure perfect calmness by performing all the experiments in a large lecture-room, with all the doors and windows closed. To secure exposure of the flame to the influence of intense solar light, without heating the atmosphere, he employed the reflecting mirror of a large solar microscope with the condensing lens and tube, and by this means a pencil of light was thrown on the flame, and traversed it without imparting a sensible amount of heat to the surrounding air. The rate of burning was determined thus:—

"A portion of candle, three or four inches in length, was secured to the bottom of one of the scale-pans of a tall balance and ignited. After allowing it to burn for ten or fifteen minutes, so as to secure a steady flame of constant size, it was *nearly* balanced by adding weights to the opposite scale-pan, allowing a slight preponderance to the candle-pan. In a short time the equilibrium was established by the burning of the candle; the precise *time* at which the balance indicated a condition of equilibrium was *accurately noted.* Next *a given* weight (say 60 or 100 grains) was withdrawn from the weight-pan, and the *time* of restoring the equilibrium by the loss of weight in the burning candle, was, in like manner, recorded."

The state of the barometer and thermometer were recorded, and the following table gives the result of three sets of experiments:—

Date.	Bar. reduced to 32° Fah.	Tem. of Air, Fah.	Time of consuming 60 grs.		Amount consumed in 10 min.		Difference.
			Dark.	Sunlight.	Dark.	Sunlight.	
		Degs	m. s.	m. s.	grs.	grs.	grs.
May 9...	29·92	67	26.24	26.15	22·73	22·86	−0·13
June 6...	29·72	75·5	28.39	28.45	20·94	20·87	+0·07
June 10..	29·62	84	28.55	28.51	20·75	20·80	−0·05

These experiments indicate *no sensible* difference in the rate of combustion, and are all the more remarkable, as it might have been expected, looking at Dr. M'Keever's experiments, that the effects would have been more marked when the light was increased in intensity by concentration from the lens. The difference on different days shows the effect of slight alterations in external conditions, namely—1st, barometric pressure; 2nd, temperature of the air; and 3rd, the amount of aqueous vapour present.

1st. Barometric pressure. On the authority of Sir Humphrey Davy,* Mons. Friger, a French civil engineer, engaged in conducting certain mining operations† in which it became necessary to work in condensed air, and Mr. J. Mitchell, whose experiments on the rate of combustion of the fuses of shells in high altitudes were lately given in a letter to the Royal Society,‡ Prof. Le Conte concludes that the process of combustion is *retarded* by a diminution in the density of the air, while it is *accelerated* by its condensation.

2nd. Temperature of the air. On this point Professor Le Conte considers that the information is meagre, the experiments of Grotthuss and Sir H. Davy being contradictory in their results, and the effect of the "hot blast" not being applicable in the present case, the air in that case not being in its *natural state* of density, and the increase of temperature being due to the fact that less heat is carried off in the process of combustion. In the absence of direct experimental evidence, Professor Le Conte, reasoning on well-known physical principles, that increase of temperature is equivalent to diminution of barometric pressure, concludes that it tends to retard combustion, and, further, that if the temperature of the flame be *constant*, then the *draught*, which will be dependent on the difference between the temperature of the flame and that of the surrounding atmosphere, will be diminished in warm air, and, hence, combustion will be *retarded.* It is, however, possible that augmentation of temperature might tend to accelerate combustion by favouring the liquifaction of the wax, and thus facilitate the oxydation of the combustible matter.

3rd. Amount of aqueous vapour present. It is obvious that the presence of aqueous vapour can only tend to *retard* the process of combustion, and Professor Le Conte refers to Sir H. Davy,§ M. Deijardin,‖ of Lile, and Mr. David Waldie.¶

Professor Le Conte unfortunately did not observe the hygrometric conditions of the air during his experiments, hence, these are, of necessity, thrown out of consideration. In Dr. M'Keever's experiments barometric indications are not given, nor is it known how many were performed in one day, whilst in Professor Le Conte's the data for estimating the combined influence of pressure and temperature are given.

Professor Le Conte then proceeds to estimate, on the assumption that Dr. M'Keever's experiments were made on the same day, the adequacy of *temperature*, to account for the difference in the rate of burning, and from the great discrepancies in the ratios, he concludes that there must have been some disturbing cause vitiating the accuracy of the experiments. Temperature alone is not sufficient to account for the diminished rate of burning. He then discusses his own experiments to ascertain if

* "Researches on Flame," Philos. Trans., 1817, p. 45, and Works of Sir H. Davy, edited by John Davy, vol. 6, p. 57.

† Comptes Rendus, Tome 13, p. 884. Annales de Chimie et de Physique, 3d Series, p. 234. The following are the words of M. Triger, "A la pression de trois atmosphères, cette accélération devient telle que nous avons été obligés de renoncer aux chandelles à mèches de coton pour les remplacer par des chandelles à mèches de fil. Les premières brûlaient avec une telle rapidité, qu'elles duraient à peine un quart d'heure, et elles répandaient en outre une fumée intolérable."

‡ Philosophical Mag., 4th Series, vol. 10, p. 48.

§ Phil. Trans., 1817, p. 65.

‖ Comptes Rendus, Tome 5, p. 28, also Tome 35, p. 368.

¶ Philos. Mag., 3rd Series, vol. xiii, p. 86.

rapidity of burning on *different* days varies according to the combined effects of barometric and thermometric oscillations, and he finds that the rate of combustion increased in a higher ratio than the density of the air, and hence concludes that some other agency must have operated in these cases.

In discussing Mr. Mitchell's experiments, he finds that the augmentation in the rate of burning increases in a somewhat higher ratio than the density of the air, while the contending influence of atmospheric density in the phenomenon of combustion is clearly demonstrated.

Professor Le Conte concludes his paper by saying,—

"From the foregoing discussion it is evident that the subject demands a thorough experimental investigation, with a minute attention to all of the external conditions which may influence the results. This I propose to undertake during the next twelve months. In the mean time it is hoped that these preliminary researches may prepare the way for a clearer appreciation of the difficulties which are to be encountered. Perhaps, however, in the present stage, we may be warranted in deducing *two* conclusions; 1st, that *solar light does not* seem to exercise any sensible influence on the process of combustion; and 2ndly, that variations in the *density of the air do exert* a striking effect in retarding or accelerating the rapidity of the process, the rate of burning augmenting with every increment of density and *vice versa*; but the exact ratio between them remains to be determined."

COPPER IN THE SEA.

The following is extracted from the *Scientific American*:—

Some five years ago, two French chemists demonstrated that the ocean contained a notable portion of silver. Recently these and other philosophers have again been at work upon the same subject; following it up, however, much more closely, they now tell us that, calculating the whole ocean, it cannot contain less than two millions of tons of silver in solution. The truth of this statement is verified by experiments tried at various parts of the world—one more famous than the rest by Mr. Field, an English chemist, who lives at Coquimbo, in Chili. The water he analysed was taken from the Pacific Ocean, and afforded the same result as that which the French chemists obtained from the water taken off St. Malo, France, in the English Channel. That the ocean should contain minute portions of every substance of the globe that is soluble in saline water is not surprising; therefore we are, in a measure, prepared for the further discovery that the "old grey beard," ocean, contains also an enormous quantity of copper—a fact recently proved in the laboratory of Mr. Septimus Piesse. The beautiful blue colour of portions of the Mediterranean Sea is due, he says, to an ammoniacal salt of copper, while the greenness of other seas is owing to the chloride of copper. The method of extracting silver from the sea is one of simple affinity. Granulated copper being suspended in the "briny waves," any silver salt that is contained therein is decomposed, a portion of the copper is dissolved, and the silver is precipitated thereon, from which it is afterwards parted by the usual means adopted in every laboratory. By a happy analogy, Mr. Piesse separated copper from the sea by the same process. His experiments were performed between the ports of Marseilles, on the French Mediterranean coast, and Nice, in Sardinia. A bag of nails and scrap iron was suspended at the side of the steamer which plies between these places, and after the first voyage (about twelve hours), copper was indicated to be present on the iron. Four separate voyages, however, were made before the bag of iron was removed to the laboratory; then the quantity of copper was found to be so great that much surprise was shown that the presence of this metal had not been previously discovered, especially as the action of sea water on ships' bottoms has long been known. Mr. Piesse is continuing his experiments.

SOUTH KENSINGTON MUSEUM.

During the week ending 19th December, 1857, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 2,660; on Monday and Tuesday (free evenings), 3,767. On the three students' days (admission to the public 6d.), 530. One students' evening, Wednesday, 125. Total, 7,082.

Home Correspondence.

FOOD GRAINS.

SIR,—All the writers on this subject seem to be very much mystified when the hard wheats of the warmer climates come under consideration in respect of their value as a material for the production of flour.

Hard wheat, properly so called, is never made use of by the natives for the production of flour in a separate form, nor can flour be made from it except under certain circumstances.

The primary use of hard wheat is that of grinding it into *semolina* for the manufacture of *macaroni*, which is never made from flour. When a grain of hard wheat is dissected, no flour, or the material of which it is made, is found in the interior, the whole of its substance being composed of a semi-transparent horny matter, easily convertible into *semolina* by rather coarse grinding.

When hard wheat is to be ground into flour, it is only used in a mixture composed of the following articles, in nearly equal proportions, viz., soft wheat, hard wheat, barley, broad beans, from the coast of Barbary, Indian corn, horse beans, field peas, vetches, &c., &c.

The mixture is ground in powerful water-mills, that is, those that have heavy hard millstones, sharply dressed, and capable of grinding the whole of such a heterogeneous composition, cuticle included, into tolerably fine flour or meal, with very little bran in it, and that not always sifted out.

The bread made from such flour rises well, and is very nutritious and sustaining, but it is very dark, sometimes almost black, and is universally the food of the farmer and his labourers, and others of that class.

I am, &c., HENRY W. REVELEY.

COAL AND COKE.

SIR,—The very interesting discussion arising out of Mr. Apsley Pellatt's paper, "On the Comparative Heating Powers of Coal and Coke," appears to be profitably continued in the Society's *Journal*. Among the communications on this subject, in yesterday's number, I find a letter from Mr. Henry W. Reveley. There are so many sound views taken in that letter, that I regret having to object to any. The writer, however, quoting from my "Prize Essay," appears to have so mistaken my views on some points, and even to have somewhat severely commented on the same, that I request permission to put the matter right before the Society.

Mr. Reveley says, "In the well-known 'Prize Essay' on this subject, by Mr. C. Wye Williams, there is scarcely an allusion to the subject of ashpits, and none whatever to the possibility of half the mischief being caused by their very faulty construction." So far, however, from that being the fact, among "the respective duties which each part of a furnace or boiler has to perform," the second head for examination is, "of the ashpit and the area below the fuel," the first being, "of the chamber of the furnace and the area above the fuel."

Treating of the area in the chamber of the furnace, I have dwelt on the "chemical and mechanical reasons for providing an enlarged chamber." As a practical rule, I have even given the required proportions, and have commented strongly on the want of adequate space. On the

next head, "the area of the ashpit below the fuel," I commented on the similar error which prevails in improperly making the ashpit "long and shallow." I then observed that what was said with reference to the ill-judged proportions of the chamber above the fuel, was equally applicable to the ashpit below it, to avoid the mere repetition of the same reasons, adding, "the object being to enable the air to rise with a moderate velocity, equally, to all parts of the fuel and bars." It does not appear possible more adequately to comment on the want of due proportions in the ashpit and the means of correcting them.

The writer then adds, "Mr. Williams acknowledges that the Cornish system of firing is essentially the most economical in the evolution of heat from a given quantity of fuel in a given time, yet insists on the necessity for building and setting our furnaces and boilers on faulty and erroneous principles, and then curing the evils produced by means of costly patent inventions, which seldom, however, meet with success." I am at a loss to conceive how the writer could have so entirely mistaken my views. I need only say they are the reverse in every particular of what he has imagined them to be.

I have shown how the furnaces and boilers should be constructed, and this method, in the experience of many years, and numerous land and marine boilers, has never failed. As to the use of "costly patent inventions," I have shown that no patent inventions are required, and that such as are costly should be particularly avoided, the cost being generally the result of mechanical appliances which are either unnecessary or injurious.

Mr. Reveley then adds: "Singularly enough, Mr. Williams goes on to state that the excellence of the Cornish system is at the expense of time, space, and first cost of boilers." The first item, expense of time, he observes, is "incomprehensible, for all boilers must, of necessity, furnish a given quantity of steam, at a given pressure, and in a given time." Now, this is directly begging the question, since he does not define either the quantity, pressure, or time; and it is well known that one of the Cornish boilers does not produce one-half the quantity of steam that a boiler of similar proportions does on the Lancashire system, by reason of the slow combustion adopted in the former, and the rapid combustion in the latter.

The principle of the Cornish system is slow combustion, with thin and frequent firing. By this means, as shown in the prize essay, no more gas is evolved on each square foot of furnace than can be effectively supplied with air, and its perfect combustion thereby insured. Here, then, economy is obtained at the expense—that is —the expenditure, of time. In illustration, take the following carefully-performed experiments, to test the Cornish system of slow combustion as opposed to the rapid combustion in marine steam-boilers:—

	Coal used per hour.	Water evaporated per hour.	Water evaporated per lb. of coal.	Ditto, from 212°	Pyrometer heat in flue.
Slow Combustion (as in Cornwall)	149 lbs.	1425 lbs.	9·56	11·58	810°
Quick Combustion...	262 lbs.	2534 lbs.	9·45	11·45	1212°

Here 1425 lbs. only of water were evaporated in the hour, whereas, by more rapid combustion, 2534 lbs. were evaporated in the same time. The difference in the weight of fuel used will shew the saving, at the expense of time. To compensate this, in Cornwall a second boiler would be provided.

"Expense of space," Mr. Reveley considers as "absurd," nevertheless, if slow firing and long boilers were adopted in our steam ships, it is self-evident the expense or loss by the requirement of so much additional space would be an irremediable evil.

Mr. Reveley overrates the value of large boilers, when he says, "boilers that do not require forcing, or hard firing, will last out, perhaps, ten times those that require such treatment." Now, hard firing is the adopted system in steam navigation with smaller boilers, to save the expenditure and waste of *time* and *space*, yet, 8 years is about the average life or durability of our boilers. This would, according to Mr. Reveley, give a long life of 80 years to a Cornish boiler.—I am, &c.,

C. WYE WILLIAMS.

Liverpool, Dec. 19th, 1857.

AGRICULTURAL IMPLEMENTS.

SIR,—On the perusal of Mr. S. Sidney's paper, lately read before the Society of Arts, there appear several things which require notice.

The first in order is the comment upon Scotch agriculturists and their "barbarous implements." The Scotch ploughs are not made in England, but were originally made in Scotland, and are still extensively manufactured there; and, as an instance, I will just say that Messrs. John Gray and Co., of this place, the original makers of the iron Scotch plough, are now sending into England and Ireland, and exporting, about two thousand of these ploughs annually, besides the demand for home (Scotch) use. The Scotch plough has been copied by English makers, who, to secure a portion of the trade, acknowledge its origin by the name.

The Scotch threshing machines are as effective on the corn as the English, and are also home-made, though principally, if not altogether, on Meikle's original plan —threshing clean but breaking the straw. This plan *originally* comprised threshing drum with feeding rollers, shakers, riddle, elevators, fan and dressing apparatus, in effect nearly the same as the plan now in use in English combined machines. These parts were copied only singly by the English makers; and the "mere box for beating out the corn in a rough way," was a part of the combination which was altered before the other parts, also altered, were applied to it by the southern machine makers. The threshing machine is essentially of Scotch invention, Scotch adoption, and many are yet made slightly modified from the old model.

Will Mr. Sidney be kind enough to say how the "whites," so long the bane of the machine maker or agricultural engineer, are so effectually extracted and separated from the grain, and the market price of this? If he will, I am sure he will solve a problem long sought to be unravelled, and but just accomplished by shelling, or beating, or rubbing by means of patented appliances. I have generally found them in "best corn," and not in the "tail corn."

Again, 100 to 150 quarters, or 130 to 200 bolls of corn, is above the average quantity of best corn obtained from a day of 10 hours threshing; say, rather, 60 to 80 quarters, or 80 to 110 bolls, at a cost of 1s. 3d. to 1s. 6d. per quarter, or 1s. to 1s. 2d. per boll.

Mr. Sidney seems to have a very imperfect knowledge of Meikle's machine, and the present Scotch machine or mill as it is called. The great argument against machine threshing was, and, to a great extent, still is, the breaking of the straw; flail threshing, the use of that "antiquated instrument of stupefaction" is still continued in the "best cultivated counties," in Oxfordshire, and more particularly in the metropolitan counties, and in the immediate neighbourhood of large towns, because the straw, thus treated, commands a better price for packing and other purposes; it also produces the best barley for malting, which is very frequently thus threshed. The flail is not gone into disuse, but may be still found at work, as also hand-sowing.

In speaking of steam-engines, the firm of Clayton, Shuttleworth, and Co., is put prominently forward, and the names of those who were more forward in date in the production of portable engines omitted. The names

of Howden, Tuxford and Dean, the pioneers of the engines, surely deserve a passing word as much as Tull, Menzies, and others; but I, in common with others, am much surprised at the entire omission of Tuxford's name, the firm which has, for nearly three years, held the chief prize for these engines, and whose make of engine is distinct from any other. The name of the town of Boston, too, was not thought worthy to be given with the others,—the birth-place of the portable engine and portable steam-threshing machine. What has a railway or telegraph station to do with portable engines, whose portability and readiness of application to any purpose where steam-power is applicable, are available in any place? Fixed barn works may be influenced by this cause, in the expense of carriage, but not portable engines and other portable machines.

If Mr. Sidney had paid a little more attention to "antiquarian curiosities" and "mechanical toys," some errors might have been avoided in his paper, as also the charge of mentioning certain parties and omitting others. The steam horse of Boydell, and the cultivator of Romaine, the rotary plough of Usher, the ploughing system of Williams, and the high-pressure engine of Collinson Hall, are "mechanical toys" deserving notice, mechanical in their details and realised facts, yet entirely omitted.

Opinions have been lately invited and freely given as to the prizes offered by the Royal Agricultural Society, and if this Society has been the means of raising "small blacksmiths into large engineers," Mr. Sidney may rely upon it that the judges would never have awarded prizes to their productions without satisfying themselves that the implements were required and were the best of the kind. Witness his own remarks on Crosskill's clod-crushers.

While touching upon haymakers and other implements, he omits all mention of mills; surely this was an oversight, as they are among the most useful implements of a farm.

The remark about the plough, seen while hunting in Essex, would have been better omitted. Perhaps, as a straggler, he had time to examine the mode of culture and tools employed; at any rate, if he sums up his knowledge of agricultural implements at present as he has done, and gives that as containing his opinions, I beg leave to refer him for some further information to some papers of mine read before the Institution of Mechanical Engineers at Birmingham last year, and this, on the application of steam-power to agricultural purposes, where he will find facts and results that may surprise him; or, perhaps, the forthcoming work on the machinery of the farm, by Stephens, may be worth a place in his library.

For the Scotch, I claim the invention of the threshing machine (combined) and the Scotch plough. To these Mr. Caird has added the horse hoe and reaping machine—may I also add the steam plough?

I must apologise for intruding my remarks upon your notice, but believing that some reply was called for, I venture to solicit a place for this in your *Journal*, and I am, &c., WILLIAM WALLER.

Uddingston by Glasgow, Dec. 14, 1857.

Proceedings of Institutions.

DARLINGTON.—In order to raise fuuds for the purchase of new books, the committee of the Mechanics' Institution organized a grand soirée, which took place in their hall on Tuesday, the 1st of December. About 350 attended. Messrs. Pease, F. Mewburn, junr., and other friends contributed pictures and engravings. The Government School of Art sent examples of their successful pupils, and Mr. Shennessey, gardener to John Harris, Esq., decorated the room with garlands, About twenty-eight ladies and friends of the Institute contributed the repast, and many of the former assisted at the tables. £17 13s. 6d. was taken at the door. The Darlington Philharmonic Band lent their services for the occasion. Henry Pease, Esq., M.P., President of the Institute, occupied the chair, and delivered an introductory address, treating generally on the past history and present objects of the Institution. He then called upon the Rev. J. G. Pearson, who spoke of the benefits resulting from Mechanics' Institutions, and the remarkable progress made by them of late years in public estimation. He was followed by Captain O'Brien, who spoke to a similar effect. Mr. Francis Mewburn, junr., then addressed the meeting, dwelling especially upon the connection of the Institution with the Society of Arts, and giving an outline of the history of that Society. Mr. Mewburn enlarged upon the advantages resulting from the Society's Examinations, and explained the system as set forth in the programme just issued. Mr. Joseph W. Pease, and Mr. F. L. Kipling, then addressed the meeting, which separated after passing the usual votes of thanks.

HOLBECK (NEAR LEEDS).—On the 24th November, a lecture, on Durham Cathedral, was delivered before the members of the Church Institute, by the Rev. N. Greenwell, B.A. The history of this venerable and stately pile was traced, by the lecturer, from the earliest period down to the death of Bishop Van Mildert. The lecturer described the building as having been founded in 1093. Its length, including the western porch, is 507 feet, and its greatest breadth 200 feet. It has a central tower 214 feet in height, a fine west front, with a Galilee chapel, and two richly ornamented towers 143 feet in height. The lecture was illustrated by a ground plan and elevation of the edifice, and every portion of the building was briefly described. Mr. Greenwell gave a description of the funeral of the last Prince Palatine, of which he was an eye-witness. Some well executed drawings of the Old Monks, St. Cuthbert's Banner, and the cruel Earl Cassilis, added considerably to the interest of the lecture. The attendance of members and friends, notwithstanding the unfavourable state of the weather, was remarkably good.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, Dec.* 18, 1857.]

Dated 11th August, 1857.

2147. Richard Husband, Manchester—An improvement in the manufacture of hats.

Dated 2nd November, 1857.

2784. James Apperly and William Clissold, Dudbridge, Gloucestershire—Improved means of and apparatus for feeding fuel to furnaces.

Dated 3rd November, 1857.

2794. Anthony Charles Sacré, Brussels—An improved apparatus for measuring water.

Dated 25th November, 1857.

2942. Frédérique Lemaire, Tavistock-street, Covent-garden—An improved petticoat for ladies' wear. (A communication.)

2944. Frederick Herbert Maberly, Stowmarket, Suffolk—An improved general polishing machine or apparatus.

2946. Camille Bernard, 39, Rue de l'Echiquier, Paris—Certain improvements in heating apparatus. (A communication.)

2948. Edmund Charles Tisdall, Holland Park Farm, Kensington—Improvements in the mode of preserving animal and vegetable fluids, and fluids containing animal and vegetable substances.

Dated 26th November, 1857.

2950. William Blinkhorn, Sutton, near Saint Helen's, Lancashire—Certain improvements in machinery or apparatus for grinding and smoothing, and for polishing glass.

2952. John Frederick Shoner, 4, Church-street, Kennington—Improvements in common road carriages.

2954. Joseph Ruston and James Toyne Proctor, Lincoln—An improved arrangement of machinery for dressing grain.

Dated 27th November, 1857.

2956. William Bowers Taylor, Ballymena, Antrim, Ireland—Improvements in driving looms for weaving.

Dated 28th November, 1857.

2960. Benjamin Peach, Leicester—Sundry improvements in bedsteads, elastic bed bottoms, the seats of chairs, sofas, and other similar articles. (A communication.)

2964. Antoine Alphonse Chassepot, Paris—Improvements in breech-loading fire-arms.

2966. Robert Tindall, junr., Fraserburgh, Aberdeen—Improvements in harpoon guns and ammunition.
2968. Frederic Groom Grice, West Bromwich, Staffordshire—New or improved machinery for the manufacture of bolts, spikes, rivets, screw blanks, and other articles of like manufacture.

Dated 30th November, 1857.

2970. John Nichols, Pendleton, near Manchester—Improvements in machinery or apparatus used for sizing yarns or threads.
2972. Thomas Kaye, Grange-moor, Whitley-lower, near Dewsbury—Improvements in looms for weaving.
2974. Pierre Ambroise Montel, Paris—An improved motive power.
2976. Daniel Kinnear Clark, 11, Adam-street, Adelphi—Improvements in furnaces for promoting the combustion of fuel without smoke, and the communication of heat, especially adapted to steam boilers.
2978. James Howard, Bedford—Improvements in the construction of ploughs.
2979. Alfred Vincent Newton, 66, Chancery-lane—Improved machinery for cleaning carpets and other fabrics. (A communication.)
2981. Simon Solomon, Wood-street, Spitalfields—Improvements in umbrella, parasol, and walking sticks or canes.

Dated 1st December, 1857.

2983. Frederic George Spray, London—Improvements in the manufacture of gunpowder.
2984. Richard Hipkiss and William Olsen, Birmingham—Improvements in lubricating shafts and axles, and other articles requiring lubrication.
2985. Denny Lane, Cork—Improvements in lighting, regulating, and extinguishing street and other gas lamps by means of electricity.

Dated 2nd December, 1857.

2987. Edward Clarence Shepard, Jermyn-street—Improvements in magneto-electric machines.
2988. John Summers, Stalybridge, Cheshire, and David Wormald, Dukinfield—Improvements in machinery for manufacturing clog irons, and heels and tips for boots or other coverings for the feet.
2989. Joseph Eccles, Blackburn—Improvements in drying and colouring, or ornamenting bricks, tiles, pipes, and other articles made of plastic earths.
2990. Joseph Hetherington, Birmingham—A new or improved manufacture of the bowls of castors for furniture.
2991. William Bird and Richard Ashton, Blackburn, and Thomas Bird, Manchester—Improvements in looms and pickers for looms.
2992. William Thomson, Dalkeith-park-gardens, Mid Lothian, N.B.—Improvements in machinery or apparatus for propelling ships or vessels.
2993. Charles Jean Michel Moireau, 23, Avenue de la Porte Maillot, Passy, near Paris—A composition to be used as a substitute for bees' wax.
2994. John Fowler, jun., 28, Cornhill, and William Worby, Ipswich—Improvements in apparatus used when ploughing, tilling, or cultivating land.
2995. Joseph Francis, United States, and Charles Manby, Great George-street, Westminster—Improvements in the manufacture of waggons and other vehicles, applicable to the transport of troops and military and other stores on land and water.
2996. Alexander Parkes and Henry Parkes, Birmingham—Improvements in the manufacture of sheathing metals.
2997. John Livesey, New Lenton, Nottingham—Improvements in the manufacture of pile fabrics, and in the machinery employed therein.

Dated 3rd December, 1857.

2998. Louis Frederic Ernest Ciceri, 38, Rue Pigale, Paris—Improvements in the preparation of white as a basis of colour.
2999. George Tomlinson Bousfield, Loughboro'-park, Brixton—Improvements in collapsible boats. (A communication.)
3000. Robert Hazard, Thanet-place, Temple-bar—Improvements in a self-acting reclining chair or couch.
3001. Elijah Slack, Glasgow—Improvements in the treatment, application, and use of wheat and other grains and amylaceous vegetable substances.
3002. John Reeve, 46, Rutland-gate—Improvements in propelling vessels.
3003. Charles Henwood, Oxford—An improved arrangement of galvanic battery suitable for medical purposes.
3004. William Parsons and James Attree, Brighton—An improved cock or tap and flushing apparatus.

Dated 4th December, 1857.

3005. James Buchanan, Liverpool—Improvements in smoke-consuming apparatus, applicable to boiler and other furnaces.
3006. Abraham Ripley, Saint Helens, Lancashire—Improvements in mills for grinding myrabolams, valonia, bark, and other similar substances.
3007. James Hamilton, Halifax—Improvements in the construction of "strained wire fencing" for dividing fields, parks, and pleasure grounds.
3008. Henry Deacon, Woodend Chemical Works, Widnes Dock, near Warrington—Improvements in the manufacture or production of soda and potash.
3009. John Rubery, Birmingham—Certain improvements in the manufacture of umbrellas and parasols, and in the application of a new condition of material to the production of some of the parts thereof that has not heretofore been used for that purpose.
3010. Julien d'Helle, and Albert Viscount de Waresquiel, Paris—Improvements in railway rolling stock.
3011. Samuel Henry Sewers, Curry Rivel, Somerset—An improved powder for dusting turnips, and machinery for distributing the same, which may be employed for similar and useful purposes.
3012. Joseph Grizard, Nevers, France—Improvements in watches, and in the means of or for winding up and setting watches.
3013. Wm. Standring, Bury-road, Rochdale—An improved throstle and mule spring for the under clearers of spinning machines.
3014. Alexander Morton and James Howden, Glasgow—Improvements in obtaining motive power.

Dated 5th December, 1857.

3015. Stanislas Jules Count Ostrorog, Paris—A wind musical instrument.
3016. William Caldwell, Liverpool—An improved fluid meter, which may be used as a motive power engine.
3017. Marc Antoine François Mennons, 39, Rue de l'Echiquier, Paris—Improvements in lucifer matches. (A communication.)
3018. William Mercer, William Bodden, and William Higginson, Oldham—Improvements in certain parts of machinery for slubbing and roving cotton.
3019. Thomas Sidebottom Adshead, and Abraham Holden, North-end, near Stalybridge, Cheshire—An improved self-acting combination of machinery for the grinding of carding engine rollers.
3020. William Thomas Henley, 46, St. John-street-road—Improvements in ropes and cables for telegraphic or other purposes, and in machinery used in the manufacture of such and other ropes and cables.
3021. John Brinton and James Crabtree, Kidderminster—Improvements in the preparation of weft yarn to be used in the manufacture of carpets and other pile fabrics.
3022. James Sinclair, Hill-street—Improvements in machinery or apparatus for cutting or dividing stone and marble.
3024. William Edward Newton, 66, Chancery-lane—Certain improvements in apparatus for laying submarine telegraphic cables. (A communication.)

Dated 7th November, 1857.

3025. Daniel Hiley, Percival Hiley, William Hargreaves, and Enoch Haley, Bradford—Improvements in power looms for weaving worsted, cotton, silk, woollen, and other fibrous substances.

WEEKLY LIST OF PATENTS SEALED.

December 18th.

1701. George Pemberton Clark.
1709. Horace Hollister Day.
1713. Thomas Spencer.
1717. Horace Hollister Day.
1721. Edward Kirk, James Leadbetter, and Chas. Wilson.
1724. Samuel Fox.
1726. Samuel Fox.
1728. Benjamin Richardson.
1735. William Edward Newton.
1741. John Norris, jun., and G. Worstenholm.
1742. Sir Frs. Charles Knowles, Bart.
1759. Richard Morcom.
1775. Edouard Besnier de la Pontonerie.
1781. Josiah Wright, A. Wright, and Francis Roberts.
1789. William Price Struvé.
1809. Arsène Auguste Olivier.
1810. George Swindells and Jonathan Arnold.
1811. John Carter and Brook Hodgson.
1815. Samuel Nye.
1845. Charles Orphin and Edward Lyons.
1853. Joseph Lockett and William Watson.
1855. Alexander Angus Croll.
1871. Thomas Bowden.
1918. Thomas Vicars, senr., Thomas Vicars, junr., Thomas Ashmore, and Jas. Smith.
2085. Antoine Galy-Cazalat and Adolphe Huillard.
2343. James M. Miller.
2433. Arthur Rigg, senr., and Arthur Rigg, junr.
2505. Samuel Clarke.
2587. Fennell Herbert Allman.
2695. Thomas Hamilton and Jas. Hamilton.

December 22nd

1746. William Knapton.
1748. William Symons.
1754. Joseph Scipion Rousselot.
1755. Rd. Archibald Brooman.
1762. Charles Fréderic Vasserot.
1765. John Juckes.
1768. Charles Sanderson.
1776. Charles Grafton Page.
1777. John Talbot Pitman.
1779. William Green.
1782. Elijah James Crocker.
1783. John Ingham, Ed. Ingham, and Benjamin Ingham.
1787. William Palmer.
1793. John Lloyd, M.D.
1796. William Parsons.
1797. Benjamin Nichols and Samuel Ledward.
1805. Charles Thurber.
1807. Richard Howland.
1812. William Edward Newton.
1819. John Forster Meakin.
1829. Andrew Spottiswoode.
1830. William Pole.
1849. William Rowan.
1850. William Rowan.
1862. John Agar and William Agar.
1905. Charles Patrick Stewart and David Graham Hope.
1923. John Gill.
1944. Peter Rector Smith, M.D.
1976. Guillaume Defis.
1987. Samuel Ramsden.
2227. Henry Hodges.
2500. Stephen Smith.
2623. Edward Keighley.
2647. Richard Wright.
2739. Elizabeth McDowall.

Patents on which the Stamp Duty of £50 has been Paid.

December 14th.

2763. Bernard Hughes.

December 16th.

2688. Robert Walker.
2694. Henry Render.
2710. Felix Marie Baudouin.
2719. Warren De la Rue.

December 17th.

2666. Louis Henri Frederic Melsens.
2668. John Henry Johnson.
2684. William Milner.

December 18th.

2702. John Hunt.